

**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently amended) A tissue engineering scaffold for cell, tissue or organ growth comprising a biocompatible porous polyurethane cellular material comprising a plurality of ~~voids interconnected by pores~~ regularly shaped close packed and interpenetrating voids, the material having a plurality of pores that interconnect the voids, the cellular material further having a void content from 85% to 98% and a surface area to volume ratio of from 5 to 400 mm<sup>2</sup>/mm<sup>3</sup>.
2. (Original) A scaffold as claimed in claim 1 wherein the surface area to volume ratio is from 10 to 200 mm<sup>2</sup>/mm<sup>3</sup>.
3. (Currently amended) A scaffold as claimed in ~~the preceding claims~~ claim 2 wherein the surface area to volume ratio is from 20 to 80 mm<sup>2</sup>/mm<sup>3</sup>.
4. (Original) A scaffold as claimed in claim 1 wherein the void mean diameter ranges from 20 to 300 microns.
5. (Original) A scaffold as claimed in claim 4 wherein the void mean diameter is from 40 to 250 microns.
6. (Original) A scaffold as claimed in claim 5 wherein the void mean diameter is from 80 to 200 microns.
7. (Currently amended) A scaffold as claimed in ~~any preceding~~ claim 1 wherein the voids are substantially spherically shaped.

8. (Currently amended) A scaffold as claimed in ~~any preceding claim~~ claim 1 wherein the pore diameters are 10 to 50% of the void diameters.
9. (Currently amended) A scaffold as claimed in ~~any preceding claim~~ claim 1 wherein the pores are generally elliptically shaped.
10. (Currently amended) A scaffold as claimed in ~~any preceding claim~~ claim 1 wherein the material consists of three-dimensional ~~cells~~ voids with flattened faces at points of contact therebetween.
11. (Currently amended) A scaffold as claimed in claim 10 wherein any given ~~cell~~ void has up to 14 faces.
12. (Currently amended) A scaffold as claimed in claim 11 wherein some of the faces contain interconnecting pores between adjacent ~~cells~~ voids.
13. (Currently amended) A scaffold as claimed in ~~any of claims 4 to~~ claim 12, wherein the average number of interconnecting pores in any given ~~cell~~ void is from ~~[[2]]~~ 1 to 14.
14. (Currently amended) A scaffold as claimed in claim 13 wherein the average number of interconnecting pores in any given ~~cell~~ void is from 1 to 7.
15. (Currently amended) A scaffold as claimed in ~~any preceding~~ claim 1 wherein less than 10% of the voids have less than 2 pores.
16. (Currently amended) A scaffold as claimed in ~~any preceding~~ claim 1 wherein the ~~cellular~~ material is cleaned using a solvent with a solubility parameter of from  $17\text{MPa}^{0.5}$  to  $27\text{MPa}^{0.5}$ .

17. (Currently amended) A scaffold as claimed in any preceding claim wherein formation of the cellular material includes has a soft phase and hard phase.
18. (Original) A scaffold as claimed in claim 17 wherein the polar ratio of the polymer is from 1.4:1 to 10:1.
19. (Original) A scaffold as claimed in claim 18 wherein the polar ratio of the polymer is from 2:1 to 5:1.
20. (Currently amended) A scaffold as claimed in claim 17 wherein the cellular material has a hard segment context of from 35 to 65%.
21. (Currently amended) A scaffold as claimed in claim 20 wherein the cellular material has a hard segment context of from 35 to 55%.
22. (Currently amended) A scaffold as claimed in claim 21 wherein the cellular material has a hard segment content ~~context~~ of from 40 to 50%.
23. (Currently amended) A scaffold as claimed in ~~any preceding claim~~ 17 where ~~[[the]]~~ a cohesive energy density of the hard phase is at least  $2\text{MPa}^{1/2}$  greater than ~~[[the]]~~ a cohesive energy density of the soft phase.
24. (Currently amended) A scaffold as claimed in ~~any preceding claim~~ 17 wherein ~~[[the]]~~ a leachables content of the cellular material is less than 1.0mg per gram when extracted in water.
25. (Currently amended) A scaffold as claimed in ~~any preceding claim~~ 24 wherein the leachables content of the cellular material is less than 10 $\mu\text{g}$  per gram when extracted in water.

26. (Currently amended) A scaffold as claimed in ~~any preceding~~ claim 25 wherein the leachables content of the ~~cellular~~ material is less than 0.1µg per gram when extracted in water.
27. (Currently amended) A scaffold as claimed in ~~any preceding~~ claim 1 wherein the scaffold is manufactured from a reaction formulation comprising
- 4,4 diphenyl methane diisocyanate (MDI) ~~with~~ containing a 2,4 diphenyl methane diisocyanate MDI isomer content of less than 3%;
- a linear, long chain diol which is free of tertiary carbon linkages;
- water;
- a cross-linking agent;
- a trimerisation catalyst;
- a blowing and/or gelling catalyst; and
- a surfactant.
28. (Original) A scaffold as claimed in claim 27 wherein the diol is polytetramethylene ether glycol (PTMEG).
29. (Original) A scaffold as claimed in claim 27 wherein the diol is a polycarbonate diol.
30. (Original) A scaffold as claimed in claim 29 wherein the polycarbonate diol is a reaction product of one or more diols with a carbonate monomer.
31. (Currently amended) A scaffold as claimed in ~~any of claims~~ claim 27 ~~to 30~~ wherein the diol molecular weight is between 400 and 5000.

32. (Original) A scaffold as claimed in claim 31 wherein the diol molecular weight is between 500 and 2500.
33. (Currently amended) A scaffold as claimed in ~~any of claims~~ claim 27 ~~to 32~~ wherein the trimerisation catalyst is a carboxylate.
34. (Original) A scaffold as claimed in claim 33 wherein the trimerisation catalyst is a potassium acetate.
35. (Original) A scaffold as claimed in claim 34 wherein potassium acetate is present in the reaction formulation in an amount of from 0.02% to 0.12% by mass of the formulation.
36. (Currently amended) A scaffold as claimed in ~~any of claims~~ claim 27 ~~to 35~~ wherein the cross-linking agent is present in the reaction formulation in an amount of from 1% to 5% by mass.
37. (Original) A scaffold as claimed in claim 36 wherein the cross-linking agent is trialkanol amine.
38. (Original) A scaffold as claimed in claim 37 wherein the cross-linking agent is triethanolamine.
39. (Currently amended) A scaffold as claimed in ~~any preceding~~ claim 27 wherein ~~[[the]]~~ an isocyanate index of the reaction formulation is from 1.03 to 1.20.
40. (Original) A scaffold as claimed in claim 39 wherein the index is approximately 1.13.
41. (Currently amended) A scaffold as claimed in ~~any of claims~~ claim 27 ~~to 40~~ wherein the reaction formulation includes a chain extender.

42. (Original) A scaffold as claimed in claim 41 wherein the chain extender is a linear aliphatic diol.
43. (Original) A scaffold as claimed in claim 42 wherein the linear aliphatic diol is 1, 4 butane diol.
44. (Currently amended) A scaffold as claimed in ~~any of claims~~ claim 41 ~~to 43~~ wherein the chain extender is present in the formulation in an amount of less than 7% by mass.
45. (Original) A scaffold as claimed in claim 44 wherein the chain extender is present in the formulation in an amount of less than 4% by mass.
46. (Currently amended) A scaffold as claimed in ~~any of claims~~ claim 27 ~~to 45~~ wherein water is present in the reaction formulation in an amount of from 0.6% to 1.8% by mass.
47. (Withdrawn) A formulation for forming a tissue engineering scaffold according to any preceding claim comprising:
  - an isocyanate;
  - a chain extender;
  - water; and
  - a cross linking agent,wherein the isocyanate is MDI with a 4,4 MDI isomer content of greater than 97% and wherein the isocyanate index of the reaction formulation is from 1.03 to 1.20.

48. (Withdrawn) A formulation as claimed in claim 47 wherein the isocyanate index is approximately 1.13.
49. (Withdrawn) A formulation for forming a tissue engineering scaffold of any of claims 1 to 46 comprising:
- diphenyl methane diisocyanate (MDI) with a 2,4 MDI isomer content of less than 3%;
  - a linear, long chain diol which is free of tertiary carbon linkages;
  - water;
  - a cross-linking agent;
  - a trimerisation catalyst;
  - a blowing and/or gelling catalyst; and
  - a surfactant.
50. (Withdrawn) A formulation as claimed in claim 49 wherein the diol is polytetramethylene ether glycol (PTMEG).
51. (Withdrawn) A formulation as claimed in claim 49 wherein the diol is a polycarbonate diol.
52. (Withdrawn) A formulation as claimed in claim 51 wherein the polycarbonate diol is a reaction product of one or more diols with a carbonate monomer.
53. (Withdrawn) A formulation as claimed in any of claims 49 to 52 wherein the diol molecular weight is between 400 and 5000.

54. (Withdrawn) A formulation as claimed in claim 53 wherein the diol molecular weight is between 500 and 2500.
55. (Withdrawn) A formulation as claimed in any of claims 49 to 54 wherein the trimerisation catalyst is a carboxylate.
56. (Withdrawn) A formulation as claimed in claim 55 wherein the trimerisation catalyst is a potassium acetate.
57. (Withdrawn) A formulation as claimed in claim 56 wherein potassium acetate is present in the reaction formulation in an amount of from 0.02% to 0.12% by mass of the formulation.
58. (Withdrawn) A formulation as claimed in any of claims 49 to 57 wherein the cross-linking agent is present in the reaction formulation in an amount of from 1% to 5% by mass.
59. (Withdrawn) A formulation as claimed in claim 58 wherein the cross-linking agent is trialkanol amine.
60. (Withdrawn) A formulation as claimed in claim 59 wherein the cross-linking agent is triethanolamine.
61. (Withdrawn) A formulation as claimed in any of claims 49 to 60 wherein the isocyanate index of the reaction formulation is from 1.03 to 1.20.
62. (Withdrawn) A formulation as claimed in claim 61 wherein the index is approximately 1.13.
63. (Withdrawn) A formulation as claimed in any of claims 49 to 62 wherein the reaction formulation includes a chain extender.



64. (Withdrawn) A formulation as claimed in claim 63 wherein the chain extender is a linear aliphatic diol.
65. (Withdrawn) A formulation as claimed in claim 64 wherein the linear aliphatic diol is 1, 4 butane diol.
66. (Withdrawn) A formulation as claimed in any of claims 63 to 65 wherein the chain extender is present in the formulation in an amount of less than 7% by mass.
67. (Withdrawn) A formulation as claimed in claim 66 wherein the chain extender is present in the formulation in an amount of less than 4% by mass.
68. (Withdrawn) A formulation as claimed in any of claims 49 to 67 wherein water is present in the reaction formulation in an amount of from 0.6% to 1.8% by mass.
69. (Withdrawn) A process for preparing a tissue engineering scaffold as claimed in any of claims 1 to 46 comprising the steps of:

preparing a isocyanate terminated prepolymer in an excess of isocyanate;

preparing a polyol reaction mixture comprising a polyol, a chain extender, a catalyst, a blowing agent, a cross linking agent, a catalyst and a surfactant;

mixing the prepolymer and the polyol

dispensing the mixed reaction ingredients into a mould;

post curing the reaction ingredients; and

solvent extracting the material with a solvent having a solubility parameter of from 17 to 27 MPa<sup>0.5</sup>.

- 70. (Withdrawn) A process as claimed in claim 69 including the step, prior to solvent extraction, of crushing the moulded cellular material thus formed to increase the open cell content of the material.
- 71. (Withdrawn) A process as claimed in claims 69 or 70 wherein the prepolymer is prepared from a prepolymer reaction mixture at a temperature of from 70 to 80°C.
- 72. (Withdrawn) A process as claimed in any of claims 69 to 71 wherein the prepolymer reaction mixture is reacted for a period of from 1 to 2 hours.
- 73. (Withdrawn) A process as claimed in any of claims 69 to 72 wherein the prepolymer reaction mixture is stirred continuously under a dry inert atmosphere.
- 74. (Withdrawn) A process as claimed in any of claims 69 to 73 wherein the rotational mixing element for mixing the prepolymer reaction mixture is configured to generate turbulent mixing.
- 75. (Withdrawn) A process as claimed in any of claims 69 to 74 wherein during moulding the mould temperature is maintained at not less than 30°C.
- 76. (Withdrawn) A process as claimed in claim 75 wherein the mould temperature is from 50 to 80°C.
- 77. (Withdrawn) A process as claimed in any of claims 69 to 76 including the step of venting the mould during moulding to facilitate free rise.
- 78. (Withdrawn) A process as claimed in any of claims 69 to 77 wherein the volume of the mould is such as to facilitate at least a ten fold volumetric expansion of the reaction ingredients.

79. (Withdrawn) A process as claimed in any of claims 69 to 78 wherein the volume of the mould is such as to facilitate a less than 50 fold volumetric expansion of the reaction ingredients.
80. (Withdrawn) A process as claimed in any of claims 69 to 79 wherein the post curing is carried out at a temperature of at least 20°C for a period of at least 30 minutes.
81. (Withdrawn) A process as claimed in claim 80 wherein the post-curing is carried out at a temperature of approximately 80°C.
82. (Withdrawn) A process as claimed in claim 80 or 81 wherein the post-curing is carried out in a post-cure oven.
83. (Withdrawn) A process as claimed in any of claims 69 to 82 wherein the post-curing is carried out in a CO<sub>2</sub> rich environment.
84. (Withdrawn) A process as claimed in any of claims 69 to 83 wherein the moulded cellular material is crushed by greater than 80% of the pre-crushed volume of the material.
85. (Withdrawn) A process as claimed in any of claims 69 to 84 wherein the crushing is carried out in the presence of a solvent.
86. (Withdrawn) A process as claimed in any of claims 69 to 85 wherein the extraction solvent used for solvent extraction has a polar component of its solubility parameter in excess of 3MPa<sup>0.5</sup>.

87. (Withdrawn) A process as claimed in any of claims 69 to 86 wherein the solubility parameter of the extraction solvent is within  $\pm 4 \text{ MPa}^{0.5}$  of the solubility parameter of the polymeric material or its phases.
88. (Withdrawn) A process as claimed in any of claims 69 to 87 wherein the vapour pressure of the extraction solvent is greater than 2 kPa at 25°C.
89. (Withdrawn) A process as claimed in claim 88 wherein the vapour pressure of the extraction solvent is greater than 5 kPa at 25°C.
90. (Withdrawn) A process as claimed in claim 89 wherein the vapour pressure of the extraction solvent is greater than 10 kPa at 25°C.
91. (Withdrawn) A process as claimed in any of claims 69 to 90 wherein the extraction solvent has a solubility parameter of from 18 to 24  $\text{MPa}^{0.5}$ .
92. (Withdrawn) A process as claimed in any of claims 69 to 91 wherein the extraction solvent used for solvent extraction is water miscible.
93. (Withdrawn) A process as claimed in any of claims 69 to 92 wherein the extraction solvent used for solvent extraction is a swelling solvent.
94. (Withdrawn) A process as claimed in 93 wherein the swelling solvent swells the material by more than 30%.
95. (Withdrawn) A process as claimed in claim 94 wherein the swelling solvent swells the material by more than 100%.
96. (Withdrawn) A process as claimed in claim 94 or 95 wherein the swelling solvent swells the material by more than 150%.

97. (Withdrawn) A process as claimed in any of claims 69 to 95 wherein the extraction solvent used for solvent extraction includes tetrahydrofuran (THF).
98. (Withdrawn) A process as claimed in any of claims 69 to 97 wherein the extraction solvent used for solvent extraction includes methyl ethyl ketone (MEK).
99. (Withdrawn) A process as claimed in any of claims 69 to 98 wherein the solvent extraction step is carried out for a period of at least 2 hours at room temperature.
100. (Withdrawn) A process as claimed in any claims 69 to 99 including the step of de-swelling the solvent swollen polymeric material.
101. (Withdrawn) A process as claimed in claim 100 wherein the polymeric material is de-swelled by contacting the solvent swollen polymeric material with a non-solvent which is miscible with the extraction solvent.
102. (Withdrawn) A process as claimed in any of claims 69 to 101 including the step of drying the polymeric material to substantially remove solvent residues.
103. (Withdrawn) A process as claimed in claim 102 including the step, prior to drying, of extracting the polymeric material with water.
104. (Withdrawn) A process as claimed in any of claims 69 to 103 wherein the polymeric material is extracted with a number of extraction solvents.
105. (Withdrawn) A process as claimed in claim 104 wherein the solvent extractions are carried out sequentially.
106. (Withdrawn) A process as claimed in any of claims 101 to 105 wherein the non solvent is an alcohol.

107. (Withdrawn) A process as claimed in any of claims 101 to 106 wherein the non solvent is added to the solvent swollen polymeric material in an amount and at a rate to maintain a low concentration gradient.
108. (Withdrawn) A process as claimed in any of claims 101 to 107 wherein the de-swelling is carried out at a temperature of less than 40°C.